Cat. No. 22-195A

OWNER'S MANUAL

Please read before using this equipment

LCD BENCHTOP DIGITAL MULTIMETER

MICRONTA®

FEATURES

This MICRONTA® Auto-Range Digital Multimeter is a portable 3-2/3 digit, bench-type multimeter ideally suited for field, lab, shop, bench and home applications. Here is a review of some of the features that qualify your new digital multimeter as a real "pro".

The latest IC and display technology is used to acheive the lowest possible component count. This, in turn, ensures reliability, accuracy, stability and a really rugged, easy-to-handle instrument. Two analog-to-digital converters are used for many special features.

Other handy features of your new multimeter are:

One-finger push button function selector.

LCD bargraph display makes nulls, peaks and trends more readily apparent.

High-low memory function — minimum and maximum of a changing input can be automatically stored into memory and recalled to the display.

Special h_{FE} check function measures transistor gain.

Fully autoranging with manual ranging override.

DATA HOLD switch "freezes" the display: you can keep the reading on the display even after you disconnect the probes.

Continuity function for quick continuity check (the buzzer sounds when circuit resistance is approximately 300 ohms or less).

Full auto-polarity operation.

Effective overload and transient protection on all ranges (except DC/AC 10A range).

Diode ⊣▷⊢ check function lets you safely check semiconductor junctions (for open, short or normal).

Low battery voltage is automatically detected and displayed.

Detented handle/stand allows easy viewing of the display.

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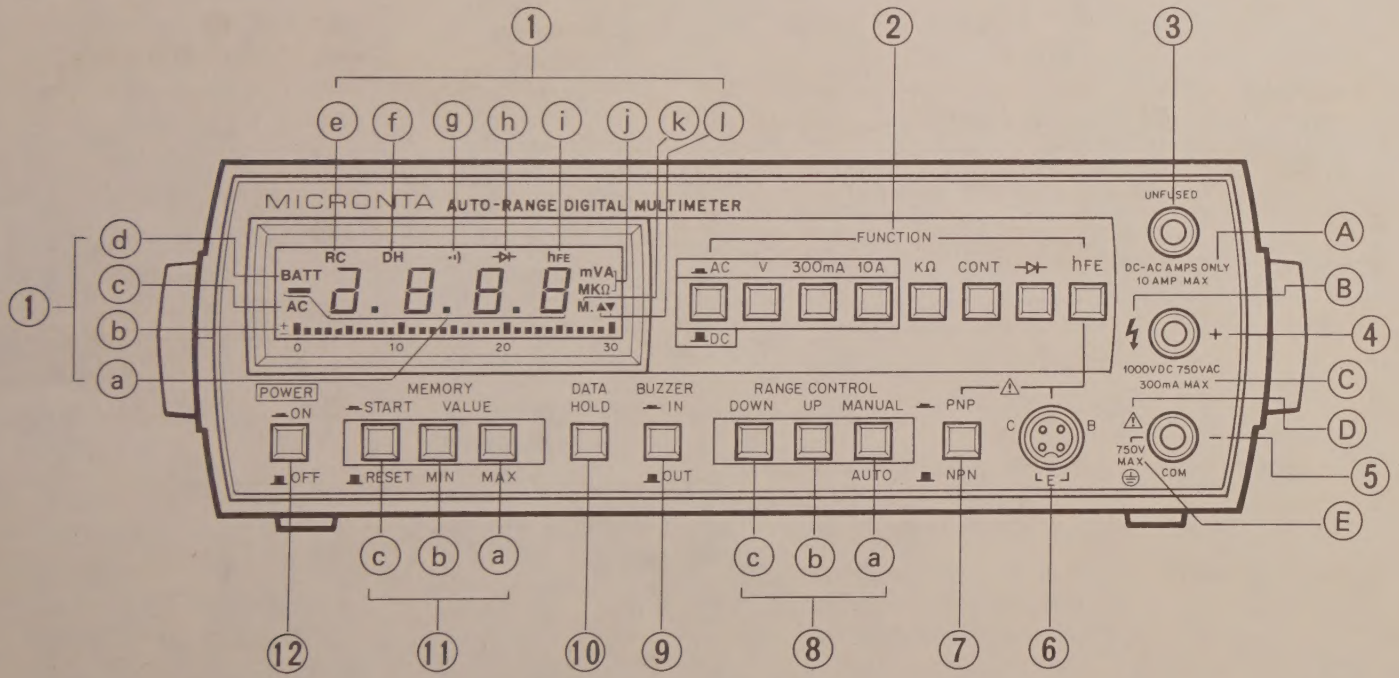
CONTROLS AND FUNCTIONS



1. Digital display:

a. Measuring value indicators — shows the measured value with decimal point and minus sign (when appropriate), 2999 maximum.

b. Bar graph with polarity indication — shows the measured value in a semi-analog type display with polarity indication. In the memory mode the graph indicates the minimum and maximum measured values.

c. AC indicator — appears when the meter is in the AC voltage or current ranges.

d. Low BATTery indicator — "BATT" appears when batteries need replacing.

e. Range Control indicator — appears when the AUTO/MANUAL switch is in the MANUAL position.

f. Data Hold indicator — appears when the DATA HOLD button has been pressed to hold the measured data on the display.

g. Continuity indicator — appears when in the CONTinuity check mode.

h. Diode check indicator — appears when in the diode check ⊣▷⊢ mode.

i. h_{FE} indicator — appeares when in the h_{FE} check mode.

j. Measuring unit indicators — indicates the current measuring unit.

k. Memory indicator — appears when the memory function is activated to retreive the maximum/minimum value.

l. ▲/▼ indicators — indicates whether the reading is the maximum (▲) or the minimum (▼) of the varying inputs.

2. Function switches: Used for selecting functions: AC/DC, V, 300mA, 10A, kΩ, CONTinuity, ⊣▷⊢ diode check, and h_{FE}.

3. Input (10A) jack: Connect the (+) red lead for measurements up to 10A when the 10A function switch is pressed.

4. Input (+) jack: Connect the (+) red lead here for all measurements other than the 10 Amp range and h_{FE} check.

5. Input (−) jack: Connect the (−) black lead here for all measurements except the h_{FE} check.

6. h_{FE} terminal: Used for testing transistors h_{FE}. Small type transistors can be plugged directly into this terminal. Otherwise, use the transistor test clip harness provided.

7. PNP-NPN switch: Press in for measuring PNP transistors. Leave in the out position for NPN transistors.

8. RANGE CONTROL switches:

a. MANUAL/AUTO — press in to cause the meter to stay in the current range and begin the manual range control. "RC" is indicated on the LCD. Press again to activate the auto range control function.

b. UP — press to move to the next higher range when in the manual range control mode. When you reach the highest range, this switch has no effect.

c. DOWN — press to move to the next lower range when in the manual range control mode. When you reach the lowest range, this switch has no effect.

9. BUZZER switch: Pressing in causes the buzzer to sound when any function is activated (except PNP/NPN mode). Buzzer will also sound when the input exceeds the maximum range (except in kΩ, CONT and ⊣▷⊢ check).

10. DATA HOLD switch: Holds the displayed data on the LCD. "DH" will appear on the LCD.

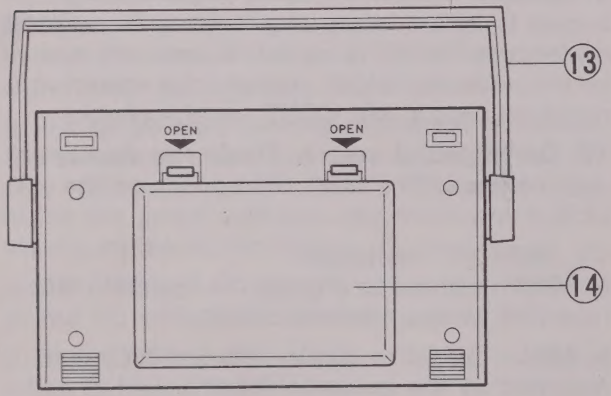
11. MEMORY switches:

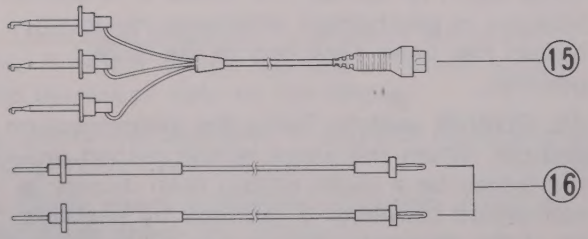
a. MAX — press to display the highest value recorded by the memory circuit.

b. MIN — press to display the lowest value recorded by the memory circuit.

c. START/RESET — press in to activate the memory function. "M" appears in the display. Press again to release the memory function. Memory is reinitialized whenever this push-button has been switched to the RESET position.

12. POWER switch: Turns the instrument on and off. When the meter is first turned on, there may be a slight pause, then display is self-tested for about 2 seconds by showing all of the elements, then it reverts to normal.





13. Detented handle: Provides for easy viewing of the display and is convenient for carrying the meter.

14. Battery/fuse compartment: Open to install/replace the fuse and/or batteries.

15. Test clip harness for h_{FE} measurement: Use if the transistor cannot be connected directly to the terminal on the meter.

16. Test lead: Banana type test leads (Cat. No. 278-704) are supplied with your unit. Always use only the same type of test leads.

EXPLANATION OF SPECIAL PANEL MARKINGS

Special markings have been added to the panel to remind you of the measurement limitations and for safety.

A. DC-AC AMPS ONLY 10 AMP MAX	The maximum current that can be measured is DC/AC 10A.
B.	Be extra careful when making measurements for high voltage; do not touch terminals or probe ends.
C. 1000 VDC 750 VAC 300 mA MAX	The maximum voltage that can be measured is 1000 VDC or 750 VAC. The maximum current that can be measured is 300 mA.
D.	Refer to complete operating instructions.
E. 750V MAX 	To avoid electrical shock and/or instrument damage, do not connect the common input terminal (−) to any source of more than 750V with respect to earth/ground.

PREPARING FOR OPERATION

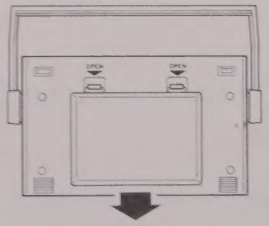
All you need to do is install four 1.5V "C" batteries. We recommend that you use alkaline type batteries — such as our 23-551.

The batteries should be removed whenever the unit is not going to be used for a few weeks.

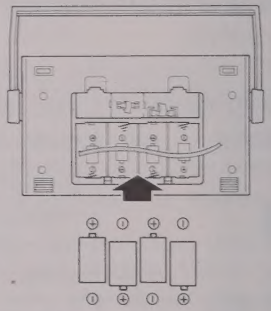
Installing Batteries

1. Be sure that POWER is OFF and the test leads are disconnected.

2. Put your fingers on both cavities and open the battery/fuse compartment cover on the rear by pressing the cover catches in the direction of the arrow.

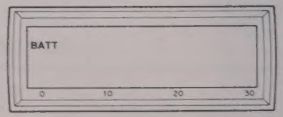


3. Snap the batteries in place. Watch polarity!



4. Press the battery/fuse compartment cover back on.

When the batteries become weak, "BATT" will appear on the left side of the display. Replace all of the batteries. NEVER LEAVE WEAK OR DEAD BATTERIES IN YOU UNIT. Even "leak-proof" types can leak damaging chemicals.



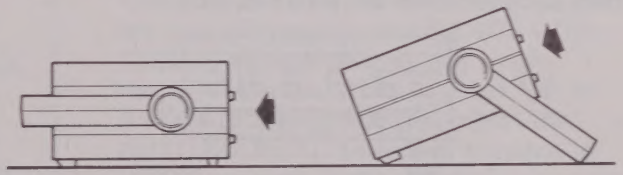
Notes for Test Leads

Use only the same type of test leads as are supplied with your unit. These leads are rated for 1200 volts; replacements are available from your local Radio Shack store (Radio Shack Cat. No. 278-704).

Caution: Although these test leads are rated for 1200 volts, the maximum rating of this meter is 1000 volts. You should not attempt to measure any voltage exceeding 1000 volts. Use extreme caution when using these high voltage ranges.

Viewing Angles

There are two detent positions on the handle. Turn the handle until it clicks into place at the position which gives you the best viewing angle.



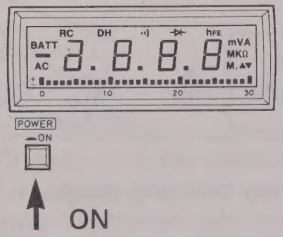
Two Viewing Angles

Warning: Use extreme caution in the use of this device. Improper use of this device can result in injury or death. Follow all safeguards suggested in this Owner's Manual in addition to normal safety precautions in dealing with electrical circuits. Do not use this device if you are unfamiliar with electrical circuits and testing procedures.

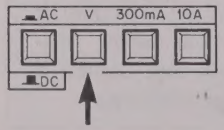
CHECK BEFORE OPERATION

1. Turn the POWER on.

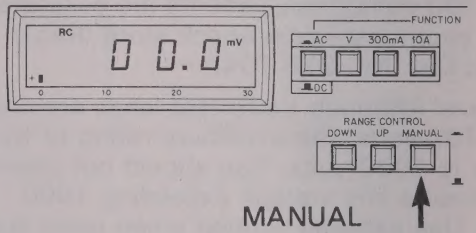
There may be a slight pause, after which all of the elements of the display will appear on the LCD. This display will last about one or two seconds then revert to normal.



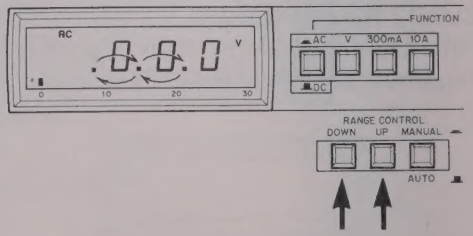
2. Press the V function switch.



3. Push AUTO/MANUAL to set the unit in the manual range select mode. RC will appear in the display.



4. Press the UP switch; the decimal point will shift as shown in the table on the page 13 as you move up the range. Try pressing the DOWN switch and changing functions to familiarize yourself with the display.



Functions	Range	Display
DCV/ACV	300 mV (DCV only)	ddd.d mV
	3 V	d.ddd V
	30 V	dd.dd V
	300 V	ddd.d V
	3000 V	dddd V
DCA/ACA	300 mA	ddd.d mA
	10 A	dd.dd A
kΩ	300 ohm	ddd.d Ω
	3 kohm	d.ddd kΩ
	30 kohm	dd.dd kΩ
	300 kohm	ddd.d kΩ
	3000 kohm	dddd kΩ
	30 megohm	dd.dd MΩ
Continuity	320 ohm (Fixed Range)	ddd.d Ω
⊣▷⊢ check	3.000 (Fixed Range)	d.ddd
h_{FE} check	3000 (Fixed Range)	dddd

Notes:

1. Use the RANGE CONTROL switches (AUTO/MANUAL, UP and DOWN) for ACV/DCV/kΩ functions. The 300 mA and 10 A current ranges are not affected by the RANGE CONTROL switches as they are single range functions. Always press UP or DOWN to change ranges when the AUTO/MANUAL switch is pressed in ("RC" appears in the display).

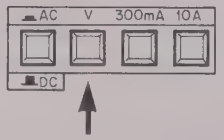
2. In some DC and AC voltage ranges with leads unconnected to any circuit, the display may show a phantom reading. This is normal. The high input sensitivity produces a "wandering" effect. When the test leads are connected to an actual circuit, a real measurement will be displayed.

3. See the unit of measure on the display to distinguish the range when two ranges have the decimal point in the same position. For example, on 300 mV range the unit display is "mV" versus "V" on 300 V range.

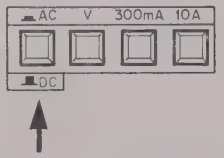
DC Voltage Measurements/AC Voltage Measurements

Important: The maximum input limit for voltage measurement is 1000VDC and 750VAC (RMS). If you attempt to measure DC voltage above 1000 volts or AC voltage above 750 volts RMS, your unit may be damaged. All of the figures on the display will blink when the maximum limits are exceeded (DC 1000V/AC 750V).

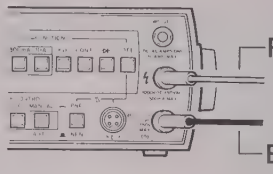
1. Press the V function switch.



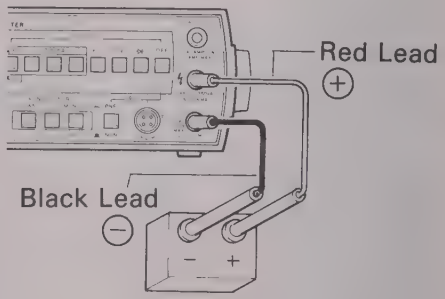
2. Select DC or AC operation. Press in AC for AC, push again to test DC.



3. Plug the red lead into the + jack and the black lead into the – COM jack.



4. Connect the probes to the circuit to be tested. In DCV, the minus sign will appear if the voltage is negative.



PARALLEL CONNECTION

5. Read the range by the position of the decimal point.

On the 300V and 300 mV ranges, the decimal point will appear in the same position (one place to the left), but when the 300 mV range is selected, "mV" will appear in the display.

When the Voltage (DC or AC) function is selected, the display may show some "phantom" readings, especially in the lower ranges. This is normal and is caused by the high sensitivity and high input impedance of the meter's circuitry. As soon as a circuit is connected, normal accurate measurements are performed.

When the function is changed from resistance, diode check or continuity to DC voltage, and the meter is in the millivolt range, the display may show overrange. This is caused by an internal voltage applied to the probe for resistance measuring which cannot be discharged due to the high input impedance of the meter. Touch the ends of probes together to discharge this voltage.

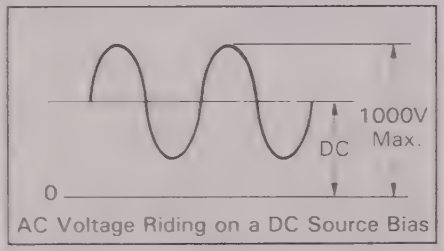
Measuring 3-Phase AC Voltages

This meter is designed primarily to measure household AC voltages. When measuring 3-phase circuits line-to-line, the value of the voltage will actually be higher than the rated line-to-ground 3-phase voltage. It is important that you do not exceed the maximum RMS AC rating of this meter, which is 750VAC. To determine the RMS voltage line-to-line on a 3-phase line, multiply the rated line-to-ground voltage by the square root of 3 (approx. 1.732).

For example, on a "480-volt 3-phase line" (i.e. 480V line-to-ground), the total available voltage line-to-line is 480 × 1.732, or approximately 832 VAC. This exceeds the rating of this meter. Severe damage as well as a dangerous shock hazard could result if the meter were connected to the circuit.

AC Voltage Riding on a DC Source Bias Measurement

You can measure an AC voltage which is superimposed on a DC voltage source bias. Press the AC switch in. However, NEVER ATTEMPT TO MEASURE OVER 1000V AC/DC.



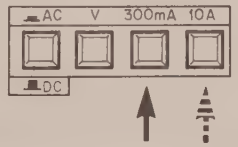
AC Voltage Riding on a DC Source Bias

Hints: When you are using the meter to probe for a voltage in a High Voltage circuit, we recommend that you do not try to position both of the probes at once. Instead, you should clamp one of the leads to the neutral or ground lead of the circuit (usually a bare, green or white lead) using our Insulated Slip-On Alligator Clips (Cat. No. 270-354), and then probe for voltages with the other probe. This helps to prevent you from accidentally touching a "hot" wire, since you need only concentrate on one test probe. Never clamp on to a "hot" wire, (usually red, black or blue), since if you did so and then touched the other probe connected to the meter, you could receive an electric shock.

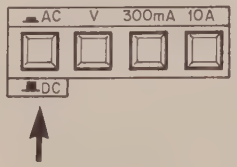
DC Current Measurements/AC Current Measurements

To measure current, you must break the circuit and connect the leads to two circuit connection points. Never connect the leads across a voltage source; doing so will blow the fuse or damage the circuit under test. The maximum input limit for DC current/AC current is 10A.

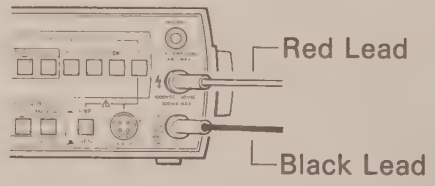
1. Press in the 300 mA or 10A function switch.



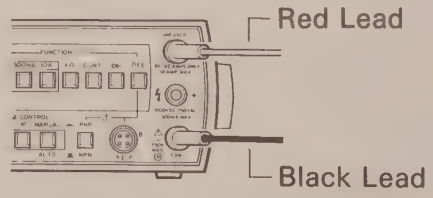
2. Select DC or AC operation. Press in AC for AC, leave out for DC.



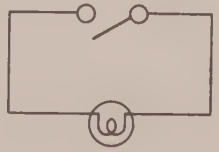
3. For 300 mA, plug the red lead into the + jack, and the black lead into the – COM jack.



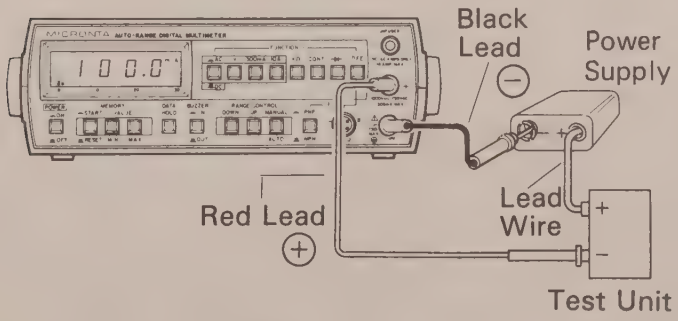
4. For 10A, plug the red lead into the DC-AC AMPS ONLY 10 AMP MAX jack, and the black lead into the – COM jack.



5. Remove power from the circuit under test and then break the circuit at the appropriate point.



6. Connect the probes in series with the circuit.



SERIES CONNECTION

7. Apply power to the circuit and read the current.

8. If the meter is set for DC Current, the minus sign will indicate the polarity of the measured current. Input of more than the maximum rate (DC/AC 10A) will cause all of the figures in the display to blink.

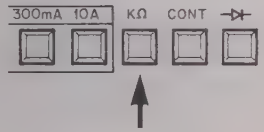
Note: The 300mA range is fuse-protected. If the meter is inoperative, check the fuse. The 10A range is not fuse-protected.

WARNING: DO NOT APPLY VOLTAGE DIRECTLY ACROSS THE INPUT TERMINALS WHILE EITHER OF THE 300mA OR 10A SWITCHES IS PRESSED IN. THE METER MUST BE CONNECTED IN **SERIES** WITH THE CIRCUIT.

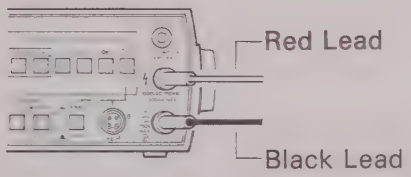
Resistance Measurements

Note: The resistance measuring circuit compares the voltage which is gained through a known (internal) resistance to the voltage developed across the resistance being measured. Thus, when checking "in-circuit" resistance, be sure the circuit under test has all power removed (are all capacitors fully discharged?).

1. Press the KΩ function switch.



2. Plug the red test lead into the + jack and the black test lead into the – COM jack.



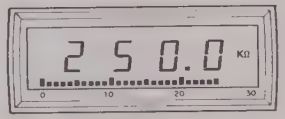
3. Connect the probes across the circuit to be measured.

4. For resistances of approximately 1 megohm and above, the display may take a few seconds to stabilize. This is normal for high resistance readings.

As with the voltage range, use the measuring unit display to determine the range the meter is in. "KΩ" or "Ω" distinguishes between 300 ohm and 300 kohm, "MΩ" or "KΩ" distinguishes between 30 megohm and 30 kohm.

300Ω Range

300kΩ Range



30MΩ Range

30kΩ Range

Notes:

1. Some devices could be damaged by the current applied during resistance measurements. The following table lists the voltage and current available in each range.

Range	A	B	C
300 ohm	3.0 V	180 mV	700 μA
3 kohm	1.3 V	310 mV	140 μA
30 kohm	1.3 V	400 mV	20 μA
300 kohm	1.3 V	460 mV	2 μA
3000 kohm	0.7 V	440 mV	0.4 μA
30 megohm	0.7 V	440 mV	0.04 μA

A is the open circuit voltage at the jacks in volts.
B is the voltage across a resistance equal to a full scale value.
C is the current through a short circuit at the input jacks.

All values are typical.

2. Your unit has a circuit which protects the resistance ranges from over-voltage (500V AC for 1 minute). To prevent accidentally exceeding the rating of the protection circuit and to ensure correct measurements, never connect the probes to a source of voltage when one of the KΩ/ ⊣▷⊢ diode check/CONTinuity function switches is pressed in.

3. When you short the test leads, the range will move to the 300 ohm scale and a small value (less than 0.5 ohms) will be displayed. This value represents the internal resistance of the meter's circuitry and the test leads. You may need to note this value and deduct it from the measured value when you are measuring a very small resistance.

CONTinuity Function

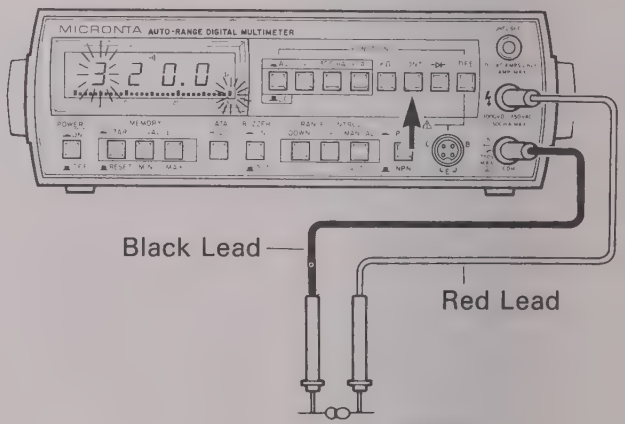
This tester has a built-in audible continuity function.

1. Press the CONT function switch.

2. Connect the red lead into the + jack and the black lead into the – COM jack.

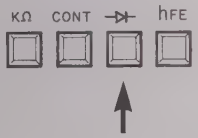
3. Connect the probes to the circuit you wish to test.

If the circuit resistance is less than about 300 ohms, the buzzer will sound.

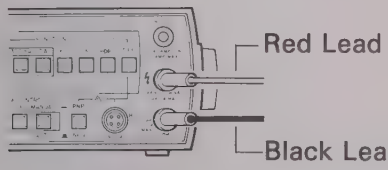


Diode Check

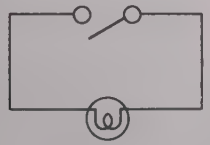
1. Press the ⊣▷⊢ function switch.



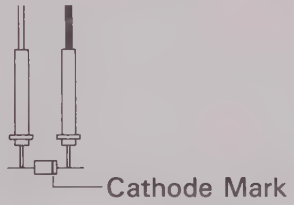
2. Plug the red test lead into the + jack and the black test lead into the – COM jack.



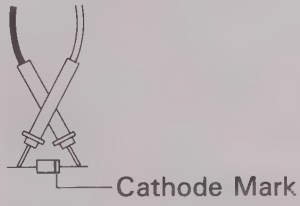
3. Remove power from the circuit under test.



4. Connect the probes to the diode you wish to check and note the display.



5. Reverse the probes and note the second reading. If one reading shows some value and the other is overrange, then the device is good. If both values are overrange, then the device is open. If both values are very small or zero, then the device is shorted.

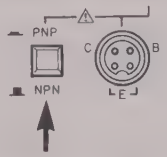


Note: The value indicated by the display during the diode check function is the forward voltage (2V max).

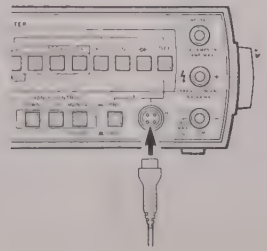
h_{FE} Function

1. Press the h_{FE} function switch.

2. Select the position of the PNP-NPN switch according to the type of transistor you are going to check.



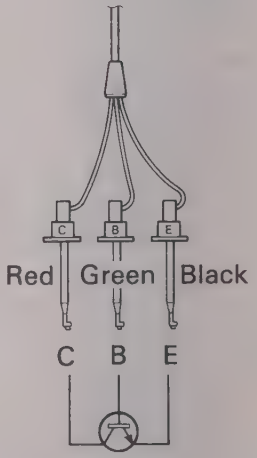
3. Connect the transistor to the socket on the front panel. The emitter can be connected to either of the lower two terminals. When the transistor cannot be connected directly, connect the transistor test clip harness to the terminal, and clip to the transistor.



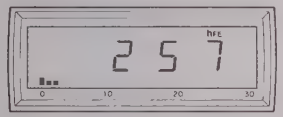
The harness is color-coded as follows:

Green:	Base
Red:	Collector
Black:	Emitter

Transistor



4. Read the h_{FE} on the display. The h_{FE} is the current gain (the ratio of the collector current to the base current) for the transistor, and therefore no unit value (ohm, amp, etc.) is displayed.



5. With no transistor connected, the last digit may "wander" between 0 and 1. As soon as a transistor is connected, normal accurate measurements are performed.

WARNING: THE TRANSISTORS MUST BE REMOVED FROM THE CIRCUIT BEFORE TESTING. OTHERWISE, FIRE HAZARD MAY RESULT.

Bar Graph

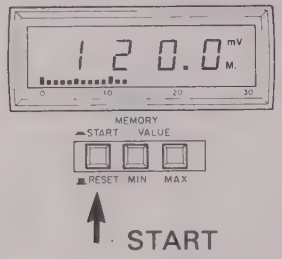
All of the measured data are also indicated dynamically on the bar graph at the bottom of the display. Each dot represents one unit of the third unit from the right on the display. You can easily observe changes in the measured data. The display also indicates the polarity for DC functions.

Example: If 12 V is input in the 30V range, the display will be as follows:

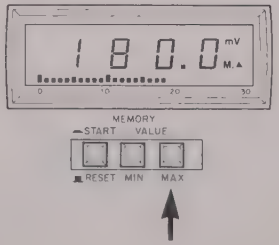
Memory Function

The maximum and minimum values of a changing input can be stored and recalled on the digital display.

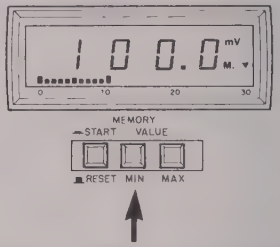
1. Push the START/RESET switch in to activate this function. "M" is displayed on the LCD.



2. Push MAX to display the maximum value. ▲ will flash on the display.



3. Push MIN to display the minimum value. ▼ will flash on the display.

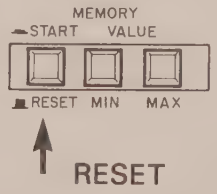


The digital display of the maximum and minimum shows only three significant digits. The first two significant digits indicate accurately the measured amount. The third significant digit is rounded to either 0 or 5. The following are representative samples of possible MAX and MIN displays.

25.0
23 50
23.5
16.5
20 00

Note: After pressing MIN or MAX for display of the stored value, pressing MIN or MAX a second time will restore the display to a readout of the present measurement without disturbing the memories.

4. Press START/RESET a second time to stop and clear the memory function.

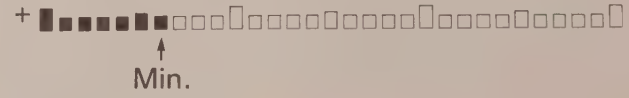


(1) While the memory function is activated, maximum, minimum and current measured values are shown on the bar graph as follows:

Example: Range: 30V DC
Measured value: 12V
Max. Value: 23V
Minimum Value: 6V

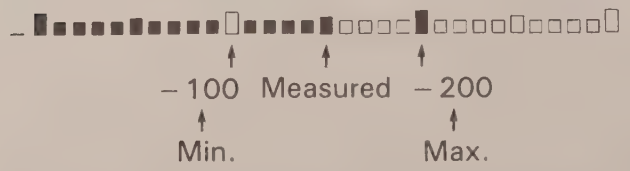
(2) Press the MAX switch to recall the maximum value to the digital display. In this example, either 23.0 or 23.5 will be displayed. The bar graph wil be as follows:

(3) Press the MIN switch to recall the minimum value. In this example either 6.0 or 6.5 will be displayed. The bar graph will be as follows:



(4) ± on the bar graph indicates the polarity of the measured DC input.

(5) The maximum and minimum values are determined by using the absolute value of the quantity measured (sign "±" is ignored).



(6) When the measurement is overrange, the rightmost dot on the bar graph blinks.

(7) When the meter is in the autorange mode, and the maximum and minimum values span over more than one range, the 0 or 30 dot blinks to indicate that the minimum or maximum value is in another range.

Note: To avoid recording excessive fluctuations caused by the initial switching or a change of ranges, the memory does not function until:

(1) 10 seconds after changing a function control or operating the UP/DOWN switches;

(2) 3 seconds after operating the AUTO/MANUAL switch; and

(3) 10 seconds after the range changes from the 3000 kohm to the 30 megohm range.

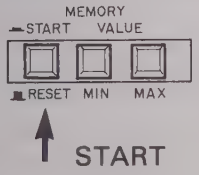
Note to the technically curious:

This unit employs two A/D converters. One serves to digitally display the measured value. This converter requires 100 ms to sample values, and updates the display 2.5 times per second. Another converter is used to measure/display the bar graph and to register MIN/MAX values. The sampling time and rate for this converter is much faster, 15 μs sample at an update rate of 7.5 times per second.

Incidentally, this rapid converter is also used to automatically shift the range, so that the auto-ranging of this meter is much faster than normal auto-ranging digital multimeters.

Using Memory Functions

(1) As you press START/RESET in, the memory begins storing the maximum and minimum of the measured values.



(2) The maximum value will be renewed whenever a value exceeding the current stored maximum value is measured.

(3) The minimum value will be renewed whenever a value less than the current stored minimum value is measured.

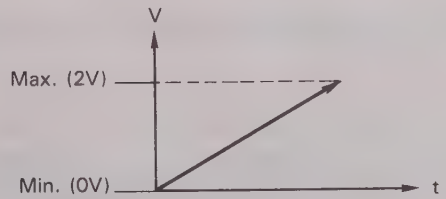
(4) The memory is reset whenever the AUTO/MANUAL switch is pressed.

Note: With the change of polarity from + to −, or from − to +, the data memorized in previous polarity will be cancelled, and the new value of the opposite polarity becomes the subject to the memory function.

Here are some examples of maximum and minimum values retained in the memory.

(1) START/RESET switch ON with 0V input, linearly increased to 2V

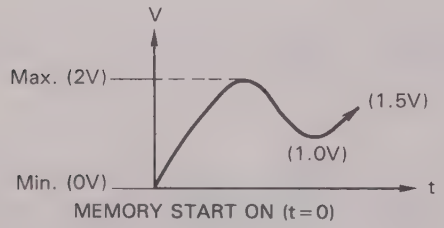
Maximum value: 2V
Minimum value: 0V



MEMORY START ON (t = 0)

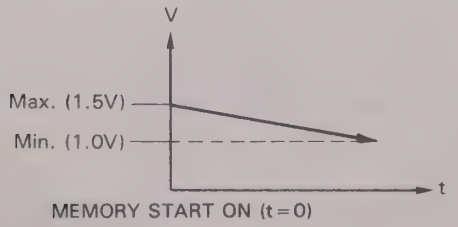
(2) Non-linearly carried to 1.5V

Maximum value: 2V
Minimum value: 0V



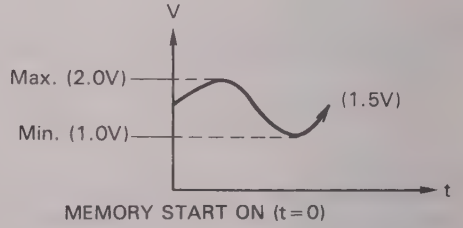
(3) START/RESET switch ON with 1.5V input, linearly decreased to 1V

Maximum value: 1.5V
Minimum value: 1V



(4) Non-linearly carried to 1.5V

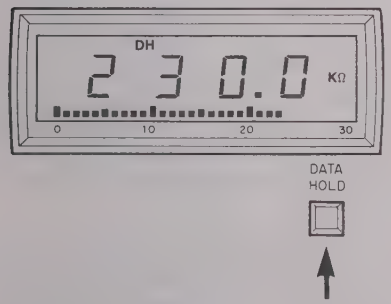
Maximum value: 2V
Minimum value: 1V



Note: If you disconnect the probes or if input is terminated, the memory function will record 0 for a minimum value. You can use the DATA HOLD function (see the next section) to retain the measured data even after the probes have been removed from the circuit.

DATA HOLD

Press the DATA HOLD switch to "freeze" all indications on the display. "DH" is displayed and any values stored in memory are retained, even if you remove the probes from the circuit.



Press DATA HOLD again to cancel DATA HOLD. Pressing a FUNCTION button may cancel DATA HOLD.

In the current ranges, switching the 300mA and 10A function switch may not cancel DATA HOLD sometimes.

The DC/AC function switch does not cancel the DATA HOLD in kΩ, CONTinuity, ⊣▷⊢ check and h_{FE} modes.

During data hold, the RANGE CONTROL and START/RESET switches are inoperative.

BUZZER SWITCH

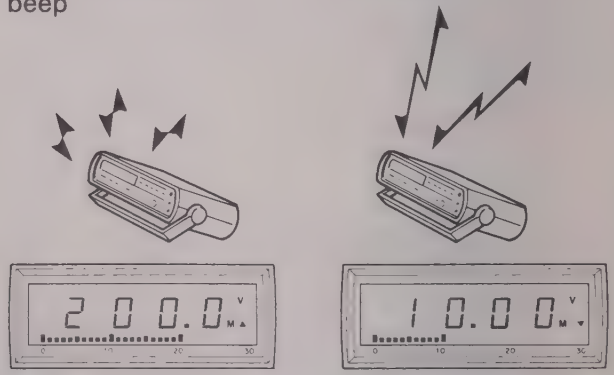
Whenever the BUZZER switch is pressed in, the meter will emit a short beep each time a function switch, range or other switch is pressed and activated (except the PNP-NPN switch).

When the input data exceeds the maximum rated value, short intermittent beeps will sound as a warning.

During memory operations, a beep will sound each time either the maximum or minimum values are renewed.

As maximum value is renewed . . . . . short intermittent beep

As minimum value is renewed . . . . . long beep



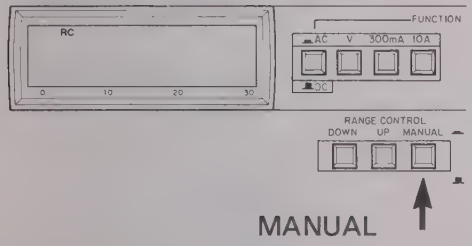
Press BUZZER a second time to turn off the buzzer feature.

Note: When the meter is in the CONTinuity check mode, the buzzer will sound regardless of the BUZZER switch position. Buzzer will not sound when a range change is made automatically.

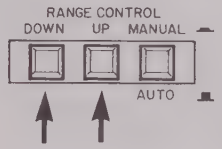
RANGE CONTROL

Autorange is a convenient feature, but sometimes it may be quicker to manually set the range, as when you are going to measure values which are known to be within a certain range.

1. In such a case, press the AUTO/MANUAL switch in to the MANUAL position. "RC" will appear in the display and the meter will be set to the current selected range.

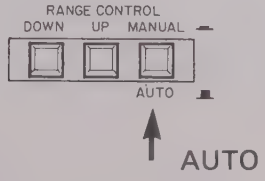


2. The range can be adjusted either up or down by pressing the RANGE UP or RANGE DOWN switch to reach the desired range.



When the range is at the maximum available range for a function, the RANGE UP switch will have no further effect. When the range is set to the lowest available range for a function, the RANGE DOWN switch has no further effect.

3. Press AUTO/MANUAL again to return the meter to the autorange mode.

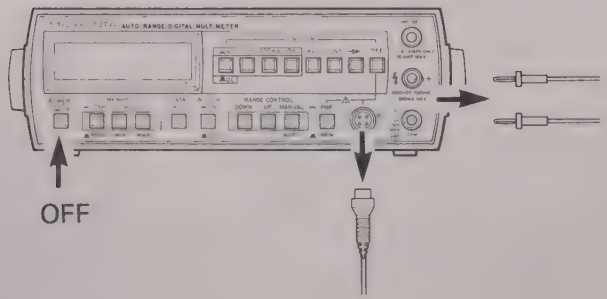


Fuse Replacement

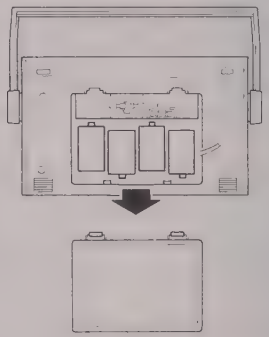
WARNING: TO AVOID ELECTRICAL SHOCK, DISCONNECT THE TEST PROBES BEFORE REMOVING THE BATTERIES OR FUSE. REPLACE ONLY WITH THE SAME TYPE OF BATTERIES OR FUSE. THIS UNIT CONTAINS NO USER-SERVICABLE PARTS. DO NOT REMOVE THE BACK COVER.

CAUTION: FOR CONTINUED PROTECTION AGAINST FIRE OR OTHER HAZARD, REPLACE ONLY WITH 0.5A, 250V FUSE (CAT. NO. 270-1241). ONE SPARE FUSE COMES SUPPLIED WITH YOUR UNIT.

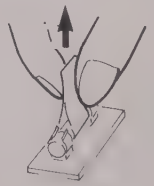
1. Be sure POWER is OFF and test leads are disconnected.



2. Open the battery/fuse compartment cover.

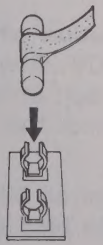


3. Pull the red ribbon in the fuse compartment; the fuse will pop out.

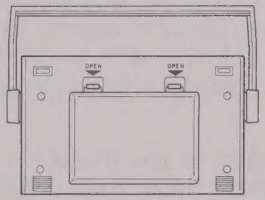


4. Insert a new fuse on the ribbon ring. Use only a fuse of the same type and rating (0.5A, 250V, 5 x 20mm miniature fuse).

5. Install the fuse with ribbon in the fuse compartment.



6. Close the battery/fuse compartment cover.



WARNING: DO NOT OPERATE YOUR UNIT UNTIL THE BATTERY/FUSE COVER IS IN PLACE AND FULLY CLOSED.

Your Digital Multimeter is a precision electronic device. Do not touch any of the circuitry inside the case. Do not expose to extreme temperatures below −4°F (−20°C) or above 140°F (60°C); protect from extremely humid areas.

To avoid damage to the meter:
A. Never connect more than 1000 volts DC or 750 volts RMS AC.
B. Never connect to a source of voltage when any of the kΩ, CONTinuity or ⊣▷⊢ diode check function switches are pressed in.
C. Never operate unless the battery cover is in place and fully closed.
D. Battery and/or fuse replacements should only be performed after the test leads have been removed and the POWER has been turned OFF.

The MICRONTA® digital multimeter comes fully calibrated and tested. Under normal use, no further adjustment should be necessary. In case the meter should require repair, do NOT attempt to service it yourself; bring it to your nearest Radio Shack store. SERVICE BY UNAUTHORIZED PERSONNEL WILL VOID THE WARRANTY.

A Word About Safety

Every precaution has been taken in the design of your meter to ensure that it is as safe as we can make it. However, safe operation depends on you, the operator. We recommend that you follow these simple safety rules:

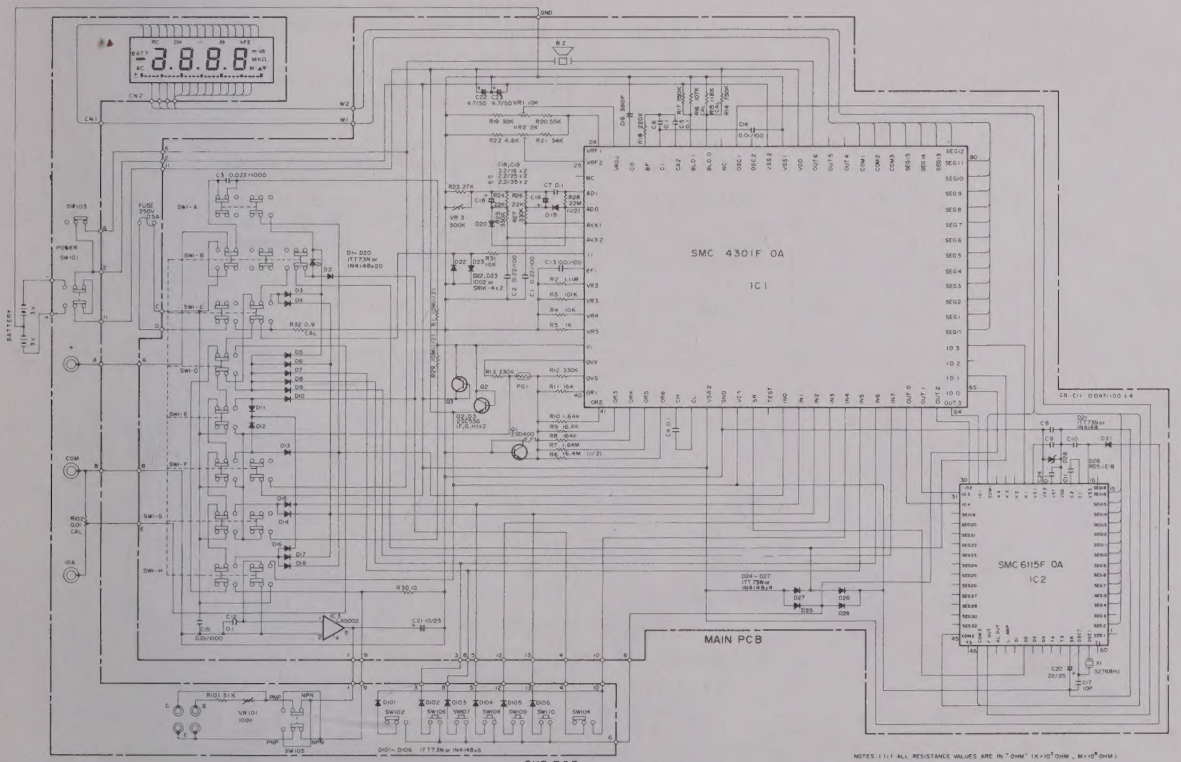
1. Never apply voltages to the meter which exceed the maximum rated limits given in the specifications. Never apply more than 1000V DC or 750V RMS AC between the input jacks and/or ground.

2. Use extreme caution when working with voltages above 100V. Always disconnect power from the circuit under test before attempting to connect the test leads to high-voltage points.

3. Always discharge all filter capacitors before attaching the test leads to a power supply circuit.

4. Since many AC-DC appliances have a potentially "hot" chassis, ensure that the top of your workbench and the floor underneath it is made of non-conductive materials.

SCHEMATIC DIAGRAM



Schematic subject to change without notice.
For most accurate Schematic (and parts) contact Radio Shack, National Parts Dept., Fort Worth TX 76101.
In Australia, contact Tandy Australia Limited, National Parts Dept., 91 Kurrajong Avenue, Mount Druitt, N.S.W. 2770
and in UK, National Parts Dept., Bilston Road, Wednesbury, West Midlands, WS10 7JN.

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This product is warranted against defects for 90 days from date of purchase from Radio Shack company-owned stores and authorized Radio Shack franchisees and dealers. Within this period, we will repair it without charge for parts and labor. Simply **bring your Radio Shack sales slip** as proof of purchase date to any Radio Shack store. Warranty does not cover transportation costs. Nor does it cover a product subjected to misuse or accidental damage.

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